SRAP
Smallholder Rubber Agroforestry Project
ICRAF/GAPKINDO

JAMBI PROGRESS REPORT
NUMBER 1/96
12-17 february
3-11 March 1996

Rubber Agroforestry Systems
R.A.S. ON FARM EXPERIMENTATION
SITES SELECTION and TRIALS PLANTING
IN THE JAMBI PROVINCE

Eric Penot, ICRAF/CIRAD-CP
Gede Wibawa Rubber Research Center of Sembawa.
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1 OBJECTIVE OF THE 2 first MISSIONS (February and March 1996)

The objective was to secure the situation with the farmers after the rubber planting material problem that occured in December 1995 and to discuss with farmers on RAS 1 weeding protocols in Muara Buat and Rantau Pandan. In Seppungur, the goal was to assess the possible use and evolution of the 6 plots in this village where rice experimentation has been a complete failure.
RAS 1/Nutrient management trial in Seppungur (formerly managed by Michael Constantinides) has been visited and checked.
Eventually, a suitable house has been found to be used as an office.

2 MEETING WITH GAPKINDO/JAMBI (February)

The GAPKINDO/Jambi cabang has accepted the budget proposal 1996 and we (all the team) want to thank them for their constant support in SRAP activities in the Jambi province. The budget proposal is in annex 1. We agreed that, on demand of GAPKINDO/JAMBI, this budget will be transfered to GAPKINDO/PUSAT in Jakarta and managed directly by it. All expenses will be reported to ICRAF (Through E. Penot coordination) and then reported to GAPKINDO/PUSAT in Jakarta.

3 OFFICE, CAR AND MATERIALS IN MUARA BUNGO.

ICRAF will provide a car (a toyota 4X4 second hand), as well as an office (to be used also as a residence for permanent staff based in Muara bungo) with a computer, a fax and furniture . Total costs is presented in the budget in annex 1.
The office should be fully operational in March 1996.

4 RAS TRIALS SITUATION

All fields/rep should have a plot file with all required and collected information.

4.1 VILLAGE OF SEPPUNGUR
RAS on farm experimentation

5 sites have been selected (see table 1) initially for RAS 2.2 trials with a rice experimentation (9 sub-plots with 3 varieties and 3 amounts of fertilisation). Rice experimentation has failed due to a drought after planting in décember (3 weeks) and the fact that it has been eaten by local cows (the fencing is not completed). Blast has been observed on wayararem variety. Farmers also complained of a very late planting. However rainfall figure shows that rice cropping is theorically still possible, it seems unrealistic to grow correctly rice late in the season.
Another problem is the fact that some farmers already selected and involved in our RAS programme decide to leave the village for another place or activities, leaving the fields with their wife in charge with limited labour resources.
Is has been decided after discussion with the farmers and according to their needs and strategies the following :
- Farmers of the first group (Saer, Sapri and Sabran) prefer to adopt another intercropping pattern : with bananas and cassava (at the condition that cassava will be harvested before 1 year old in order to limit root disease) and some other plants (palawiajs : chili, vegetables, sweet potatoes...).
According to farmers, cassava will be harvested within 6 months after planting. No cassava planting at less than 2 meters from rubber trees.

This new cropping pattern is also more adapted to farmers with law labour availability.
Rubber seedlings will be removed from the plots in october. (as soon as clonal rubber is successful and grow well).
In this group, associated trees are a combination of durian + rambutan + nangka + cempedak + mango.
The second group : ibu Alias and Adnan (with 2 replications) want to grow rice again in september 1996 with local varieties and fertilization in september 1996 (no treatment on rice). Associated trees will be Durian + duku only.

- associated trees at the planting density of 92 trees (9 x 12 meters) will be planted in March/april from the existing nurseries. See the table 2 to see the tree distribution. Tree distribution will be different in two series of plots.
- fertilization programme is that of TCSDP for UREA only for the first 2 years.

Table 1
PLOT SITUATION IN SEPPUNGUR

farmers	Farmer status	Rice experiment	type of associated trees
SAPRI	Part time activity (fisherman)	Wayararem did not germinate well. Rice has been eaten by cows	Nangka Rambutan Durian (maxi 20/ha) cempadak
SAER	OK	complete failure	same as sapri + existing trees from forest regrowth. The plot is very rich with a lot of species
SABRAN	OK The plot has not ben planted where originaly selected	complete failure	same as sapri + existing trees from forest regrowth
IBU ALIAS	Single old woman	1/4 of the plot is covered with local rice	Durian /25 in nursery Duku /25 in nursery
ADNAN	OK 2 plots : - 1 plot with GT 1 - 1 plot with PB 260	rice planted in february in plot with GT1	Durian + Duku (nursery in preparation)

TABLE 2 : SITUATION IN SEPPUNGUR :
2 RAS 2.2 trials with 3 replication each :
- 1 RAS 2.2/mixed fruit trees with palawijas intercropping
- 1 RAS 2.2/Durian+duku with rice intercropping.

farmers	Type of trial	REP	clone	Current intercrop	intercrops sheduled in 1997
SAPRI	RAS 2/2 mixed fruit trees	**1**	**GT1**	**rice + Banana/cassava**	**same**
SAER	RAS 2/2 mixed fruit trees	**2**	**GT1**	**banana/cassava**	**same**
SABRAN	RAS 2/2 mixed fruit trees	**3**	**GT1**	**banana/cassava**	**same**
IBU ALIAS	RAS 2.2 Durian + duku	**1**	**GT1**	**rice 33 %of the plot + terung**	**local rice + fertilization**
ADNAN plot1/GT1	RAS 2.2 Durian + duku	**2**	**GT1**	**rice 75 % of the plot + alang²**	**local rice + fertilization**
ADNAN Plot 2/PB 260	RAS 2.2 Durian + duku	**3**	**PB 260**	**alang²**	**local rice + fertilization**

The evolution of palawijas intercropping will be monitored.

RAS type distribution will be the following :

RAS 1 : 0
RAS 2 : 2 trials with 3 rep/farmers each(0,5 ha each)
- 1 RAS 2.2/mixed fruit trees with palawijas intercropping
- 1 RAS 2.2/Durian+duku with rice.
RAS 3 : 0

RAS 2.2 with mixed fruit trees is noted as RAS 2.2/mix
RAS 2.2 with durian and duku is noted as RAS 2.2/DD

Generally, the fields are very well cleaned as a result of a good burning. No Mikenia. Imperata is only present in Adnan's plot (this plot has been slashed in 1994). Round-up will be used in March to control Imperata

RAS 1/NUTRIENT MANAGEMENT
(FORMELY Michael's experiment)

The experiment has 24 plots of 50 trees with 2 replications with local seedlings high stumps and PB 260 (from PTP VI)

CLONAL RUBBER PLANTS
Monitoring of missing plants
(60 plants of RRIC 100 are still alive in polybag and should not be used for replacements, use PB 260 in stock in Muara Bungo).
This monitoring may be combined with growth measurements.

RUBBER SEEDLINGS :
Stems should be cut below the dry zone in order to initiate sprouting.
Effect of Colletotrichum has to be monitored and , if necessary, apply DITHANE at least for the first 6 months in order to secure the growth.

Seedlings nursery :
150 polybags should be prepared (using those already in place for BP 260 from Sembawa but the inside earth should be changed) and planted with seeedlings to constitute a reserve in case of growth failure of those already in the field. Seedlings may be ordered from the private nursery close to the gas station.
In this nursery : monitoring of sprouting : select 1 stem only.
The earth should be well pressed close to the stump at planting. Verify this for all trees in the field and in nursery.

SPROUTING MONITORING
A complete monitoring should be done on sprouting, rubber plants : sprouting should come from the grafted bud. One stem only is allowed to grow. Record dead trees in plot-file.

RUBBER GROWTH: DATA RECORDING
Growth monitoring : according to growth monitoring protocole :
- control every 3 month of (first year only) :
    - diameter 10 cm above the grafting point.
    - number of whorl (distribution)
    - height

These measures are made on 30 trees per plots, excluding the borders. See each plot map.
Record data in plot file.

FERTILISATION OF RUBBER
Fertilization programme : specific to the trial : see the protocole.
Orders of fertilizers should be combined with those of other trials.

LEVEL OF WEEDING
6 weedings per year will be implemented, on a regular basis of one weeding every 2 months for "normal weeds".
Specific monitoring on evolution of Mikenia.

4.2 MUARA BUAT and RANTAU PANDAN

RAS 1

The main problem is now the presence of Mikenia in the fields leading to a much more intensive weeding (at least every month specificaly for Mikenia). The situation is critical in Pak Bustami's and Ismael's field.
The second immediate danger for rubber plants is attacks from the monkeys on young leaves. It has been decided to use Dithane to repell the monkeys and to protect for the first 6 months the leaves againts Colletotrichum. The validity of using Dithane as a repellant has to be checked. In case of failure, it is suggested to use an insecticide.

Farmers have agreed on a weeding protocol (see anex 3)
Urea (TCSDP recommendations) wil be provided to the trees every 3 months for the first 2 years in order to ensure correct growth during critical period (50 grammes per trees each time).

RAS 2.5

The fields have not been entirely planted with rubber and cinnamon. It seems that many cinnamon plants are dying. Emphasis is put on the respect of weeding protocol (a minimum of 6 weedings per year on a regular basis).

Yani's plot

the farmer yani decided not to fomllow anymore RAS 1 but to grow palawijas and rice as intercropping during immature period of rubber, similar to RAS 2.2. It has been decided to keep it as a RAS 2.2 observation plot (ther is only one rep of this trails).

Conclusion

RAS type distribution will be the following :
MUARA BUAT/RANTAU PANDAN
RAS 1 : 4 farmers/5 plots/REP (1 farmer has 2 rep)
RAS 2.5 : 3 farmers/rep
RAS 2.2 : 1 observation plot

A programme of activities for each trial is suggested in annex.

5 PLANTING MATERIAL AVAILABILITY FOR RAS PLANTING IN october 1996 and PROPOSAL FOR TRIAL ESTABLISHMENT

The second set of PB 260 sent by Sembawa in order to replace the dead planting material of the first set has been put in polybag nursery close to Muara Bungo. From a total of 3 000 plants , around 2 500 will be available as 9 months old/5 whorls polybag planting material for any trial. We suggest to use it for 5 replication of RAS 1 with emphasis on fertilisation treatment and /or herbicide. One major constraint in RAS 1 is to plant well developped polybaged planting material as early as possible in the beginning of the rainy season (practicaly beginning of october). The first set of RAS 1 OFT has been planted end of december 1995 with polybag having 1 or 2

JAMBI PROVINCE
RAS TRIALS PLOT CHARACTERISTICS AND CHOICE BY VILLAGES

MUARA BUAT Farmers	**TYPE RAS**	**AREA selected** in ha	**Slope**	**Status**	**associated perennials**	**SITUATION IN MARCH 1996**
EFFENDI	2.5.1	0.3	50 %	Belukar 10 years old	presence of Imperata cinnamon	Rubber has not yet been planted in plot C Use dithane to repel monkeys (rubber only plot) Trees should be killed or removed require complete weeding
SANDY'PLOT	1	0.8	> 60 %	???		
M NOOR	2.5.1	0.3	50 %	half plot slashed in 93 half plot slashed in april 95	cinnamon	Cinnamon planting in plot B is too close to rubber plants Chek attack of Colletotrichum.
ALISRI	2.5.1	0.5	75 %	old belukar slashed in 95	Cinnamon	Cinnamon has not yet been planted in plot C (cinnamon only plot) Use dithane to repel monkeys Trees should be killed or removed require complete weeding
SARYONO	1	0.8	> 60 %	secondary forest	RAS 1	The 8 plots should be selected. require complete weeding for homogenisation of the plot Use Dithane to repel monkeys Planting durian in the plot id not allowed
2 rep				slashed in april 95	natural forest regrowth	
BUSTAMI/K des	1	0.4	> 60 %	slashed in april 95 old jungle rubber	RAS 1 natural forest regrowth	Use Dithane to repel monkeys require complete weeding the plot is entirely invaded by Mikenia.
TOTAL AREA Number of farmers		**3.1** 5				
RANTAU PANDAN farmers			**Slope**	**Status**	**associated perennials**	
YANI	2.2	0.5	20-30° %	Belukar	duku, Rambutan, durian	Dis not follow RAS 1 is transformed in RAS 2.2 observation plot Soybean has been planted in january
AZAHRI	1	0.4	15 %	10 years	RAS 1 natural forest regrowth	Earth should be pressed around the rubber plants Rubber has been planted in february Holes should be filled up with earth
ISMAEL	1	0.4	30-40 %	Belukar 5 years	RAS 1 natural forest regrowth	Use Dithane to repel monkeys require complete weeding the plot is entirely invaded by Mikenia.
TOTAL AREA Number of farmers		**1.3** 3				
SEPPUNGUR farmers			**Intercrop**	**Status**	**associated perennials**	
SAER	2.2/mix palawija	0.45	Banana + cassava	old belukar	Durian, duku, rambutan, cempedak no cinnamon	A lot of trees and plants
SAPRI	2.2/mix palawija	0.3	Banana + cassava		Durian, duku, rambutan, cempedak no cinnamon	well cleaned
SABRAN	2.2/mix palawija	0.3	Banana + cassava		Durian, duku, rambutan, cempedak no cinnamon	not well cleaned, a lot of trees
ADNAN1	2.2/DD/rice	0.25	rice	Old jungle rubber S&B in 1994, alang²	Durian + duku GT 1	rice planted in february 1996
ADNAN2	2.2/DD/rice	0.25	rice	Old jungle rubber S&B in 1994, alang²	Durian + duku PB 260	alang²
ALIAS	2.2/DD/rice	0.3	rice	belukar 3 years	Durian + duku	rice in 33 % of the plot terung in the rest of the plot
TOTAL AREA Number of farmers		**1.85** 5				

whorls. So there can be no direct comparison of growth between the experiments planted in year 1 and 2.
The idea is to have a second set of replication planted with the well developped planting material as early as beginning of october and see the trade-off between use of fertilization and weeding requirement. A proposal is suggested in annex 4. Another possibility is to implement a RAS 2.5 type trial with wide spacing.
Considering the problem of Mikenia in the Muara Buat area, it may be more suitable to implement this new trial in the Seppungur area (covering also the flat area as well).
Final decision should be made in April in order to select farmers and fields and prepare the trials

6 BUDWOOD GARDEN IN SRAP VILLAGES

One of the most important constraint for farmers is access to good quality rubber clonal planting material. GAPKINDO is also very sensitive to any activity that may improve this situation. We may make the following proposal to SRAP farmers and other interested farmers into a group : the establishment of a budwood garden and therefore guarantee them aCcess to GOOD QUALITY budwood. Some farmers in Seppungur have already claimed that they want to graft local seedlings in the fields with clonal budwood.
Our input may be the establishment of a small budwood garden with a maximum of 200 plants (300 m^2), from our existing stock of PB 260 and advise farmers group to use and manage the budwood garden.
A premiminary survey with discussions with farmers will be done in April and final decision may be taken in May. This activity has no cost as planting material is already available.

7 PREPARATION OF FARMING SYSTEMS SURVEY (FSS)

FSS will be implemented in the 3 villages by EP and Iwan in may 1996. Iwan should find the list of inhabitants of each village and see their main activity (farmer and others). The selection of non SRAP farmers will be done by random on this list. Their main activity should be farming. 10 farmers will be interviewed in each villages + the SRAP farmers.

ASSOCIATED TREES COMPOSITION IN RAS 2.2 IN SEPPUNGUR
Jambi province

For group I (Sapri, Saer and Sabran) : the composition of trees is the following :
Durian, nangka, rambutan, cempedak.
For group II (Alias and the 2 plots of Adnan) : the composition of trees is the following :
Durian and duku.

DISTRIBUTION OF ASSOCAITED TREES IN RAS 2.2 in SEPPUNGUR

SPECIES Plot area	per/ha	FARMERS Saer 0.45	Sapri 0.3	Sabran 0.3	Alias 0.3	ADnan1 0.25	Adnan2 0.25	TOTAL required	AVAILABLE Saer/sabri/sabra	To be purchased
Durian	18	6	3	3		3	3	18	35	
nangka	40	9	8	8				25	104	
rambutan	22	7	5	5				17	96	
cempedak	6	2	2	2				6	16	
mango	6	1	2	2				5	6	
total	92	25	20	20	0	3	3	71	257	
									Alias	
durian	18				4	3	3	10	25	
duku	74				16	9	9	34	16	18
total	92	0	0	0	20	12	12	44	41	

We purchased 30 duku (including a security stock or 12 trees)
Saer gives 6 durian to Adnan.
Other trees may be planted in the plot borders

RUBBER FERTILIZATION

DOSE PER HA PER YEAR

	UREA	SP 36	KCL
		not used	not used
	in grammes/tree	in Jambi	in Jambi
total	200	200	160
per 3 months	50	50	40
in Kg/ha/year	110	110	88

For 4 applications in 1996
March, juin, septembre, decembre

RICE FERTILIZATION

in kg/ha

	UREA	SP 36	KCL
total	100	125	75
Planting	40	125	75
40 days after	30		
80 days after	30		

ANNEXE 1

SRAP BUDGET IN THE JAMBI PROVINCE

VERSION 1 BUDGET SRAP JAMBI

January 1996

The GAKINDO/ICRAF SRAP PROJECT

DISTRIBUTION BY CONTRIBUTORS

OPERATING COST OF THE PROJECT for the PHASE I : YEAR 1996

INPUT	TOTAL COST	GAPKINDO JAMBI	GAPKINDO PUSAT	ICRAF
COST OF TRIALS ESTABLISHMENT/JAMBI for inputs	4,125,000	4,125,000		
ENUMERATOR Cost up to June 1996.	5,900,018	2,950,009 50.00%	2,950,009 50.00%	
TRANSPORTATION COST for follow-up and monitoring of the trials (Technical support mission from BPS)	5,500,000	3,666,667 66.00%	1,833,333 33.00%	
Communications and stationnery	1,000,000			1,000,000
Miscellanous	1,000,000			1,000,000
ICRAF missions 5 missions with EP	5,000,000			5,000,000
ICRAF office in Muara Bungo for SRAP activities	3,000,000			3,000,000
ICRAF car for SRAP activities	17,000,000			17,000,000
ICRAF motorbike for the SRAP field assistant	3,000,000			3,000,000
ICRAF fax for the office	1,000,000			1,000,000
ICRAF computer for SRAP office	3,000,000			3,000,000
		22%	10%	69%
FINAL COST	**49,525,018**	**10,741,677**	**4,783,343**	**34,000,001**

BUDGET FOR SRAP IMPLEMENTATION IN JAMBI PROVINCE IN 1996
INPUTS FOR TRIALS ESTABLISHMENT AND IMPLEMENTATION

ITEMS	NUMBER	COST per item	TOTAL COST	COST DISTRIBUTION GAPKINDO Jambi	ICRAF
Planting material					
Rubber clones GT1	100	1,200	120,000	120000	
cinnamon	200	80	16,000	16000	
Fruit trees (dukus)	70	2,000	140,000	140000	
Transportation			200,000	200000	
Extra labour for growth monitoring (mandays	120	3,500	420,000	420000	
1 sprayer	1	150,000	150,000	150000	
Mini sprayer	10	2,500	25,000	25000	
Dithane	15	10,000	150,000	150000	
Round-up	10	25,000	250,000	250000	
Curater (for rice in october)	10	20,000	200,000	200000	
Signs and labels for trials information			1,200,000	1200000	
sticks and paint			200,000	200000	
Miscellanous			500,000	500000	
Fertilizers			540,000	540000	
New set of trials establishment (fertilization only)			254,500	254500	
RAS 1 labour cost for weeding			1,000,000		1000000
RAS 1/Nutrient management					???
TOTAL			**5,365,500**	**4,365,500**	**1,000,000**

ANNEXE 2

PROGRAMME OF ACTIVITIES

PROGRAMME OF ACTIVITIES

RAS 1
MUARA BUAT/RANTAU PANDAN

Map of each plot with all numbered trees. Do several copies of maps.
1 copy for office. 1 copy for missing and replacements. I copy for each growth measurements.

RUBBER
Sprouting control of all rubber trees : check that there is only 1 growing stem and that the stem is growing from a bud.

Number of missing trees, dead trees ; immediate replacement of missing trees by trees in reserve in polybag. Note on the map which trees have been replaced and date of replacement. Checking at the same time as growth measurements.

LCC
Germination test of LCC seeds : LCC without treatment and LCC with boiling treatment..
Establishment of LCC in TCSDP-like plot with fertilization (280 kg of SP 36/ha so 28 kg for 1 000 m², equivalent to 500 kg/ha of RP).
Check LCC growth.

RUBBER GROWTH: DATA RECORDING
Growth monitoring : according to growth monitoring protocol :
- record every 3 month :
    - diameter 10 cm above the grafting point.
    - number of whorl (distribution)
    - height

These measures are made on 30 trees per plots, excluding the borders. See each plot map.

FERTILISATION OF RUBBER
Fertilization programme : every 3 months after planting : supply of fertilizers according to TCSDP programme FOR UREA only (see table).

WEEDING CONTROL
Control of weeding programme in each plots. See the table for each plot.
Monitor secondary forest regrowth :
- height of belukar (below/same height/above average rubber height).
- presence of Imperata
- presence of Mikania

Sandy:quadrats harvested for biomass measurement

BUKU BURUH (labour monitoring)
Control of buku buruh every month : check that all labour is correctly recorded.

SIGNS
2 type of signs : one big sign (1metre x 50 cm) for general description of the experiment + small s signs for each plot : 4 plots/replication. There is 2 replications in Sariono's field.

SPECIFIC MONITORING PER FARMER

Muara Buat

PAK SARIONO/RAS 1

- Immediate weeding on the rubber row for all the plot.
- after weeding : staking and selection of the 8 plots (2 replications)
- selected slashing of trees and shrubs above rubber height in the inter-rows.
- apply Dithane every week against simpai.
- remove the durian trees that have been planted on the border of the plot.
- a small pondok should be made for protection of PB 260 in polybag (security nursery)

Pak BUSTAMI/RAS 1

- immediate weeding on the rubber rows, in particular against Mikenia.
- apply Dithane every week against simpai.
- staking of the plot.

PAK MNOOR/RAS 2.5

- do a complete map of the plot.
- check the cinnamon plant and the survability : replace the missing ones.
- check attacks of Colletotrichum and use Dithane if necessary (the environment is very humid and favourable to leaf disease.

PAK EFFENDI/RAS 2.5

- chek plot preparation for rubber planting in the last plot
- check cinnamon and replace the dead plants.
- All rubber and cinnamon plants should be transfered from Pak Effendi's house to the pondok.
- all trees, sunghai and bamboos should be removed or killed.
- a complete weeding is necessary as soon as possible.
- If necessary : prepare some other cinnamon plants in nursery (purchase of plants).
- use Dithane against simpai

PAK ALISRI/RAS 2.5

- chek plot preparation for cinnamon planting in the missing plot
- check cinnamon and rubber and replace the dead plants.
- all trees and bamboos should be removed or killed.
- a complete weeding is necessary as soon as possible.
- If necessary : prepare some other cinnamon plants in nursery (purchase of plants).
- use Dithane against simpai

SANDY'S PLOT

- replace the dead or non-growing seedlings by those already sprouting in the river.
- put the other sprouting seedlings in polybag as a security stock for replacement.
- use of Dithane againt simpai
- earth around the seedlings should be pressed.

RANTAU PANDAN

PAK ISMAEL

- immediate weeding of the entire plot : and in particular in zones with Mikenia
- some trees inside the plot should be killed.

PAK AZARI

- earth around the rubber plants should be pressed.
- some marked rubber plants should be replaced by GT1 in polybag (there are not GT1 but AVROS type) in lines 3 and 6.
- trees marked by branches should be removed and 1 missing should be planted
- use of Dithane againt simpai
- holes should be refiled with earth
- check oidium evolution.

RAS 2.2/palawijas/rice
SEPPUNGUR

Map of each plot with all trees. Do several copies of maps.

RUBBER

Sprouting control of all rubber trees : check that there is only 1 growing stem and that the stem is growing from a bud.

Number of missing trees, dead trees ; immediate replacement of missing trees by trees in reserve in polybag. Note on the map which trees have been replaced and date of replacement. Checking at the same time as growth measurements.

RUBBER GROWTH: DATA RECORDING

Growth monitoring : according to growth monitoring protocole :

- control every 3 month of (first year only) :
    - diameter 10 cm above the grafting point.
    - number of whorl (distribution)
    - height

These measures are made on 30 trees per plots, excluding the borders. See each plot map.

FERTILISATION OF RUBBER

Fertilization programme : every 3 months after planting : supply of fertilizers according to TCSDP programme : UREA only (see table).

WEEDING CONTROL

Control of weeding programme in each plots. Weeding every 2 months : 6 weedings/year on aregular basis + more if necessary (in case of presence of mikenia for instance).

Check the weed evolution :

- presence of Imperata
- presence of mekenia

REMOVAL OF RUBBER SEEDLINGS

We agreed with farmers that rubber seedlings will removed from the plot at least in october if clonal rubber is growing well.

ASSOCIATED TREES

Verify the number of available trees in each nursery : plant species and number.

Planting of associated trees according to the protocole (map). to be done in March.

Note date of planting of trees.

If there is existing associated trees already planted or grown from belukar : conserve it if it close to a normal position and move it to another place if not.

List of trees allowed in RAS 2 : durian, rambutan, duku, jengkol, tangkill (melinjau), petai, manga, other fruits and timber trees. So far, farmers of Seppungur do not want to intercrop timber trees.

Weeding of associated trees : in circling (lilin) : diameter = 2 meters.

No fertilization.

For group I (Sapri, Saer and Sabran) : the composition of trees is the following :
Durian, nangka, rambutan, cempedak.
For group II (Alias and the 2 plots of Adnan) : the composition of trees is the following :
Durian and duku.
See the table and maps.

ASSOCIATED TREES GROWTH MONITORING

Measure the diameter of each tree every 3 month (at the same time as rubber) at 10 cm above ground level for the first year.

INTERCROPPING OF PALAWIJAS

Currently : no treatment : the entire field is one plot.
Record the palawijas grown in the inter-rows : species : banana, cassava, chili, vegetables (terung....), other...
Note on the map is there is differencies in palawijas per inter-rows or zones (for further blocking if necessary).
Note the name of local varieties of species that are grown.
Verify that banana are planted in the middle of the interrow. No cassava at less than 2 meters from ruber trees. Cassava should be removed before one year old.
Note date of planting and harvesting for all palawijas.

INTERCROPPING OF RICE

Record yield and area where rice is harvested (note variety, dtae of plantation, date of harvesting).
Note for all plots where rice is harvested the number of rice plants on 5 lines of 3 meters in order to assess the planting density.
Take a sample od 1500 grammes of rice per plot.

BUKU BURU
Control of buku buru every month : check that all labour is correctly recorded.

SIGNS
2 type of signs : one big sign (1metre x 50 cm) for general description of the experiment + small s signs for each plot : no current plots inside RAS 2.2/palawijas

SPECIFIC MONITORING PER FARMER

GROUP I

PAK SAER

URGENT
- do a map with existing trees in the plot, send it to EP
- As soon as EP replied with the map : do the plot staking for associated trees and check the planting of associated trees.
- organize the planting of banana every 12 meters in the middle of the interrow.

- chek all palawijas, vegetables grown in the field and put it on the map.
- Check the evolution of Colletotrichum and use Dithane if necessary (once a week at the beginning and then every 2 weeks).
- Check that weeding is correctly done
- UREA fertilization after weeding according to calendar (every 3 months) in March and May.
- check the missing plants or those which need to be replaced.
- growth monitoring in March.

PAK SAPRI
- do the plot sticking for associated trees and check the planting of associated trees.
- organize the planting of banana every 12 meters in the middle of the interrow.

- chek all palawijas, vegetables grown in the field and put it on the map.
- Check the evolution of Colletotrichum and use Dithane if necessary (once a week at the beginning and then every 2 weeks).
- Check that weeding is correctly done
- UREA fertilization after weeding according to calendar (every 3 months) in March and May.
- check the missing plants or those which need to be replaced.
- growth monitoring in March.
- record the rice yield and area of harvest. date of harvesting.

PAK SABRAN
- do the plot sticking for associated trees and check the planting of associated trees.
- organize the planting of banana every 12 meters in the middle of the interrow.

- chek all palawijas, vegetables grown in the field and put it on the map.
- Check the evolution of Colletotrichum and use Dithane if necessary (once a week at the beginning and then every 2 weeks).
- Check that weeding is correctly done
- UREA fertilization after weeding according to calendar (every 3 months) in March and May.
- check the missing plants or those which need to be replaced.
- growth monitoring in March.
- record the rice yield and area of harvest. date of harvesting.

Some durians have to be given to Pak Adnan (see table).

GROUP II
IBU ALIAS

- Check the sprouting of the duku in nursery. IF Duku do not survive, purchase some or ask Ibu to prepare an other nursery of 30 trees minimum
- Check the evolution of Colletotrichum and use Dithane if necessary (once a week at the beginning and then every 2 weeks).
- Check that weeding is correctly done in particular in places where terong is growing.
- UREA fertilization after weeding according to calendar (every 3 months).
- growth monitoring in March.
- record the rice yield and area of harvest. date of harvesting.

Pak ADNAN

First priority :
- check the preparation and planting for the last 3 barisan karet and the addition of 4 more trees per barisan: bring 30 PB 260 from stock nursery.
- Check that weeding on the row is correctly done in particular in places with Imperata.
- UREA fertilization after weeding according to calendar (every 3 months).
- use of Round-up against alang² with special protection to clones.
- sticking of the plot for associatde trees according to map.
- checking of associated trees planting in March (after round-up treament).

- Check the evolution of Colletotrichum and use Dithane if necessary (once a week at the beginning and then every 2 weeks).
- growth monitoring in April for GT 1 and May for PB 260.
- record the rice yield and area of harvest. date of harvesting.

RAS 2.2/palawija : Jani's plot in Rantau Pandan

This plot is the only RAS 2.2 plot in Rantau Pandan and is isolated from the other plots all located in Seppungur. This is due to the fact that the farmer did not accept to follow the RAS 1 protocole and changed his mind. It will be considered as an ***observation plot*** as the intercropped palawijas pattern (soyabean) is different from that of Seppungur (banana-cassava). The plot has no treatment.
Monitoring of rubber growth every 3 months.
Monitoring of associated trees nursery and planting. Check the available trees to be planted.
Record of soybean production on the plot.
Fertilization programme for the first 2 years as for other RAS 2.2 plots.

RAS 2.5
MUARA BUAT

Map of each plot with all trees. Do several copies of maps.

RUBBER

Sprouting control of all rubber trees : check that there is only 1 growing stem and that the stem is growing from a bud.

Number of missing trees, dead trees ; immediate replacement of missing trees by trees in reserve in polybag. Note on the map which trees have been replaced and date of replacement. Checking at the same time as growth measurements.

RUBBER GROWTH: DATA RECORDING

Growth monitoring : according to growth monitoring protocole :
- control every 3 month of (first year only) :
  - diameter 10 cm above the grafting point.
  - number of whorl (distribution)
  - height

These measures are made on 30 trees per plots, excluding the borders. See each plot map.

FERTILISATION OF RUBBER

Fertilization programme : every 3 months after planting : supply of fertilizers according to TCSDP programme (see table).

WEEDING CONTROL

Control of weeding programme in each plots. Weeding every 2 months : 6 weedings/year.
Check the weed evolution :
- presence of Imperata
- presence of Mikenia

REMOVAL OF RUBBER SEEDLINGS

All existing rubber seedlings should be removed from the plot.

CINNAMON

Planting of CINNAMON according to the protocole (map). to be done in March at latest.
Note date of planting. Monitor the dead or misssing trees and immediate replacement is required.
No other trees allowed in RAS 2.5.
Weeding of cinnamon trees : as required

CINNAMON GROWTH MONITORING

Measure the diameter of 30 trees/plot every 3 month (at the same time as rubber) at 10 cm above ground level. See map.

BUKU BURU

Control of buku buru every month : check that all labour is correctly recorded.

SIGNS

2 type of signs : one big sign (1metre x 50 cm) for general description of the experiment + small s signs for each plot :

- PLOT A : KARET SAJA
- PLOT B : KAYU MANIS SAJA
- PLOT C : KARET + KAYU MANIS

MISCELLANOUS

SIGNS

Signs wil be as ordered as soon as possible as it takes 20 days for implementation.

2 type of signs : one big sign (1metre x 50 cm) for general description of the experiment + small signs for each plot.

RICE SEEDS PURCHASE

We should buy 50 kg of local rice (the most used variety in Seppungur) and conserve it in a drum with Furadan for september planting in Alias and Adnan plots. Rice seeds should be well dried.

RAS 1/NUTRIENT MANAGEMENT
Plot under Ratna's supervision

From what we've seen, this is what we suggest could be done:

Immediate priorities:

1. Set up a nursery of local seedlings to replace those already planted that have died.

150 polybag should be prepared (using those already in place for PB 260 from Sembawa but the inside earth should be changed) and planted with seedlings. Seedlings may be ordered (1 week in advance) from the private nursery close to the gas station. See Iwan for that.

Local seedlings are growing on the plots : they all should be removed but those with one whorl may be used for replacement of seedlings that are not growing. The other local seedlings may be put also in polybag in case of.

So far : 90 % of the rubber seedlings are growing on the left-hand side ofthe field (if you enter by the door close to the road) and around 70 % on the right hand side.

For places where 2 rubber seedlings are growing let them grow up to one whorl and them supress one/ Only one stem per place.

2. Replacement of PB 260 that have died

(60 plants of RRIC 100 are still alive in polybag and should be kept in good conditions but not used for replacements).

We did not find the PB 260 plants replacement. If necessary, you can take some that are in our nursery in Muara Bungo, contact Iwan (we have 3 000 plants upthere !)

3. The earth around each tree needs to be firmly compacted - too loose at present- risk of root disease

4. Secondary shoots on the PB260 should be removed to leave one main stem for each plant.

5. First growth recording as as possible : see the growth monitoring in annex.

6. RICE: well weeded so far.

Harvest end March/beginning of April- growth looked very poor in february but is better in March. Do you want to harvest biomass samples to use as a covariate for each plot?

7. Replacement of dead local seedlings. Stems (of the ones still alive) should be cut below the dry zone in order to initiate sprouting, and prevent fungus infection.

Ongoing Maintenance/Monitoring

1. Regular checks for Colletotrichum (fungal leaf disease) and, if necessary, apply DITHANE to young (not fully developed) leaves, at least for the first 6 months in order to secure the growth.

2. Monitoring and replacement of missing plants. This monitoring may be combined with growth measurements

3. SPROUTING MONITORING: A complete monitoring should be done on sprouting, rubber plants : sprouting should come from the grafted bud. One stem only is allowed to grow.

4. RUBBER GROWTH: DATA RECORDING: Growth monitoring : according to growth monitoring protocol :

-record every 3 months of (first year only) :

- diameter 10 cm above the grafting point.
- number of whorl (distribution)
- height (from graft to top of stem)

These measures are made on 30 trees per plots, excluding the borders. See each plot map.

5. FERTILISATION OF RUBBER: Fertilization programme : specific to the trial : see the protocol. Orders of fertilizers should be combined with those of other trials.

6. LEVEL OF WEEDING: Now depending on the new design!!

RAS 1 weeding levels have been decided by the farmers as 3, 6 and 9 times per year (in the rubber row only). They think this will be frequent enough to control Mikania (we shall see!). Sandy's experiment will use the 2 levels of 3 and 9 times per year.

ANNEX 3

PROGRAMME OF WEEDING (RAS 1)
PROGRAME OF FERTILIZATION (all RAS)

PROGRAM MENBERSIHKAN LAPANGAN PERCOBAAN PETANI

RAS 1 MUARA BUAT DAN RANTAU P-ANDAN

BAGIAN 1 : 4 MENBERSIHKAN

BELUKAR DI LORONG : membersihkan di barisan karet saja

WAKTU T-ANAMAN	Mulai	+ 3 bulan	+ 6 bulan	+ 9 bulan
December 95	Mulai MARCH	pertenggahan JUNE	hakir SEPTEMBER	pertenggahan DECEMBER

BAGIAN 2 : 6 MENBERSIHKAN

BELUKAR DI LORONG : membersihkan di barisan karet saja

Waktu tanaman	Mulai	+ 2 bulan	+ 4 bulan	+ 6 bulan	+ 8 bulan	+ 10 bulan
December 95	Mulai March	Mulai may	Mulai July	Mulai September	Mulai November	Mulai January

BAGIAN 3 : 9 MEMBERSIHKAN

BELUKAR DI LORONG : membersihkan di barisan karet saja

Waktu tanaman	+ 0 hari	+ 40 hari	+ 80 hari	+ 120 hari	+ 160 hari	+ 200 hari	+ 240 hari	+ 280 hari
december 95	mulai Maret	19th April	29th May	8th July	17th August	26th September	5th Novem-ber	15th decem-ber

in 1997 : 24th of January .

BAGIAN 4 : 9 MENBERSIHKAN

LCC di lorong + membersihkan di barisan karet saja

Waktu tanaman	+ 0 hari	+ 40 hari	+ 80 hari	+ 120 hari	+ 160 hari	+ 200 hari	+ 240 hari	+ 280 hari
december 95	mulai Maret	19th April	29th May	8th July	17th August	26th September	5th Novem-ber	15th decem-ber

in 1997 : 24th of January

PROGRAM PEMUPUKAN LAPANGAN PETANI RAS

PUPUK PER POHON KARET
IN GRAMMES/tree

	WAKTU T-ANAMAN December 95	+ 3 bulan MARCH	+ 6 bulan JUNE	+ 9 bulan SEPTEMBER	+ 12 bulan DECEMBER
RP	200				
UREA		50	50	50	50
SP36					
KCL					

PEMUPUKAN KARET
PEMUPUKAN PER KHALI (setiap 3 bulan)

	UREA	SP 36	KCL
per plot of 1000 m²	2.75		
per replikasi RAS 1 (5 000 m²)	28		
per replikasi RAS 2.2/palawija (4500 m²)	12.5		
per replikasi RAS 2.5 (3 000 m²)	8.25		
PER DESA : SEPPUNGUR RAS 2.2/ palawijas (5 plots)	60		
PER DESA : RANTAU PANDAN RAS 1 x 3 + ras 2 (joni)	97		
PER DESA : MUARA BUAT RAS 1 x 3 + ras 2.5 x 3	109		

The GAKINDO/ICRAF SRAP PROJECT

JAMBI PROVINCE

RAS TRIALS PLOT CHARACTERISTICS AND CHOICE BY VILLAGES

MUARA BUAT Farmers	**TYPE RAS**	**AREA selected** in ha	**Slope**	**Status**	**associated perennials**
EFFENDI	2.5.1	0.3	50 %	Belukar 10 years old	presence of Imperata cinnamon
SANDY'PLOT	1.2	0.8	> 60 %	???	
M NOOR	2.5.1	0.3	50 %	half plot slashed in 93 half plot slashed in april 95	cinnamon
ALISRI	2.5.1	0.5	75 %	old belukar slashed in 95	Cinnamon
SARYONO 2 rep	1	0.8	> 60 %	secondary forest slashed in april 95	RAS 1 natural forest regrowth
BUSTAMI/K des	1	0.4	> 60 %	slashed in april 95 old jungle rubber	RAS 1 natural forest regrowth
TOTAL AREA Number of farmers		**3.1** 5			
RANTAU PANDAN farmers			**Slope**	**Status**	**associated perennials**
YANI	2.2	0.5	20-30° %	Belukar	duku, Rambutan, durian
AZAHRI	1.2	0.4	15 %	10 years	RAS 1 natural forest regrowth
ISMAEL	1.2	0.4	30-40 %	Belukar 5 years	RAS 1 natural forest regrowth
TOTAL AREA Number of farmers		**1.3** 3			
SEPPUNGUR farmers			**intercrop**	**Status**	**associated perennials**
SAER	2.2 palawija	0.45	Banana + cassava	old belukar	Durian, duku, rambutan, cempedak no cinnamon
SAPRI	2.2 palawija	0.3	Banana + cassava		Durian, duku, rambutan, cempedak no cinnamon
SABRAN	2.2 palawija	0.3	Banana + cassava		Durian, duku, rambutan, cempedak no cinnamon
ADNAN1	2.2/rice2.2	0.25	rice	Old jungle rubber S&B in 1994, alang²	Durian + duku
ADNAN2	2.2/rice2.2	0.25	rice	Old jungle rubber S&B in 1994, alang²	Durian + duku
ALIAS	2.2/rice2.2	0.3	rice	belukar 3 years	Durian + duku
TOTAL AREA Number of farmers		**1.85** 5			

JAMBI PROVINCE

ON FARM TRIALS REQUIREMENTS

PLANTING MATERIAL

MUARA BUAT

FARMERS	TYPE RAS	RICE VARIETY	Rice planting date in 1995	Rubber planting date	Pohon lain + PTC planting date	AREA selected in ha	TYPE OF CLONES
Farmers							
EFFENDI	2.5.1	no rice		december	january/march cinnamon	0.3	GT1
SANDY'PLOT	1.2	no rice		december		0.8	PB260
M NOOR	2.5.1	no rice		december	january cinnamon	0.3	GT1
ALISRI	2.5.1	no rice		december	january/march cinnamon	0.5	GT1
SARYONO	1	no rice		december		0.8	PB 260
BUSTAMI/K des	1	no rice		december		0.4	PB 260
TOTAL AREA of the village						**3.1**	
Number of farmers						1	

RANTAU PANDAN

farmers							
YANI	2.2	soybean	january	december	March	0.5	GT1
YANI	0		october			0	
AZAHRI	1.2	local failure	october	february		0.4	GT1
ISMAEL	1.2			december		0.4	GT1
TOTAL AREA of the village						**1.3**	
Number of farmers						4	

SEPPUNGUR

farmers		failure					
SAER	2.2	wayararem/local Sembawa/ X dari Bogor	december	december	February./March	0.45	GT1
SAPRI	2.2	wayararem/local Sembawa/ X dari Bogor	december	december	February./March	0.3	GT1
SABRAN	2.2	wayararem/local Sembawa/ X dari Bogor	december	december	February./March	0.3	GT1
ADNAN	2.2/rice2.2	local	february 1996	december	February./March	0.25	GT1
ADNAN	2.2/rice2.2	local	february 1996	february 1996	February./March	0.25	PB 260
AKIAS	2.2/rice2.2	local	december	december	February./March	0.3	GT1
TOTAL AREA of the village						**1.85**	
Number of farmers						5	
TOTAL NUMBER OF FARMEF		**13**					
TOTAL AREA OF TRIALS		**6.25**					

JAMBI PROVINCE

ON FARM TRIALS REQUIREMENTS

OTHER INPUTS

MUARA BUAT

FARMERS	Fertilizer required in KG for planting for RUBBER ONLY			Fertilizer required in KG for planting RICE for RICE ONLY			Upland rice varieties KG L1	TSP Phosphate for covercrops in 1996
	UREA	SP 36	KCL	UREA	SP 36	KCL	local 1	280
Farmers								
EFFENDI	33							
Sandy's plot	88							
M NOOR	33							
ALISRI	55							
SARYONO	88							224
BUSTAMI/K des	44							112
TOTAL /village	**341**	**0**	**0**	**0**	**0**	**0**	**0**	**336**
RANTAU PANDAN								
farmers								
YANI	55							
AZAHRI	44							112
ISMAEL	44							112
TOTAL /village	**143**	**0**	**0**	**0**	**0**	**0**	**0**	**224**
SEPPUNGUR							rice seeds : kg/ha	
farmers							50	
SAER	50							
SAPRI	33							
SABRAN	33							
ADNAN	28			25	31	19	13	
ADNAN	28			25	31	19	13	
AKIAS	33			15	19	11	15	
TOTAL /village	**204**	**0**	**0**	**65**	**81**	**49**	**40**	**0**
Number of farmers								

	Fertilizer required in KG for first year for RUBBER ONLY			Fertilizer required in KG for 1 crop RICE for RICE ONLY			Upland rice varieties KG L1	TSP Phosphate for covercrops in 1996
1996	UREA	SP 36	KCL	UREA	SP 36	KCL	local 1	280
TOTAL REQUIREMENT FOR JAMBI	688	0	0	65	81	49	40	560
TOTAL PER VILLAGE								
MUARA BUAT	341	0	0	0	0	0	0	336
RANTAU PANDAN	143	0	0	0	0	0	0	224
SEPPUNGGUR	204	0	0	65	81	49	40	0

TOTAL FERTIZER REQUIRED in kg
FOR RUBBER AND RICE AND COVERCROPS
for Jambi 1995 planting

otal ordered	UREA	SP 36	KCL
	753	641	49

COST DISTRIBUTION	Fertilizer required in KG for first year RUBBER AND RICE			Upland rice varieties KG L1
	UREA	SP 36	KCL	
STOCK	300			
TOTAL ORDERED	500	650	50	40
COST PER KG	300	500	500	1000
TOTAL COST	**150,000**	**325,000**	**25,000**	**40,000**
TOTAL COST OF INPUTS	**540,000**			

ANNEX 4
PROPOSALS FOR RAS TRIALS
to be planted in october 1996

Object : to use well developed polybaged clonal planting material with early planting in october 1996 in RAS 1 type.

PROPOSAL 1
RAS 1 with treatment on fertilization and weeding
Objective : to investigate, with advanced planting material, the trade-off between fertilization and weeding requirements.
Treatments :
- 1 - FERTILIZATION : 2 treatments
  - limited fertilization (P at planting time, + N the first 2 years)
  - complete TCSDP fertilisation programme for the first 2 years
- 2 - weeding : 3 level of weeding + TCSDP control
  - low weeding : 4 weedings/year
  - medium weeding : 6 weedings/year
  - high weeding : 9 weedings/year
  - TCSDP plot with LCC and high weeding : 9 weedings/year (control)

Plot size : 8 00 m^2 (44 trees)
Number of plots : 2 x 4 = 8
Total size per replication : 8 x 800 m^2 = 6 400 m^2
Number of replications : 5
Total trial size : 3.2 ha

Statistical design : split plot (sub treatment weeding)

Questions :

Manual weeding or use of herbicide (farmers want to try with herbicide). Trials and estate management in Cote d'Ivoire (control of weeds with 4 chemical treatments a year with Folar) show evidences of the interest of using herbicide in order to save labour the first 2 years.
Problem ; the presence of Mikenia (Akar) is jeopardizing the whole concept of RAS 1 with limited weeding the first 2 years. We may try to find out which chemical is active against it or we do this trial in flat area, close to Seppungur where Mikenia is still not present.
I am in favour of having an herbicide treatment and implementing the trials in Seppungur area.

PROPOSAL 2

RAS 2.5 wide spacing with treatment on cinnamon and durian.

Objective : to investigate, with advanced planting material, the interest of rubber wide spacing planting density with cinnamon and durian intercropping.

Treatments :

- 1 - Rubber + cinnamon + durian (Rubber 12 x 3 X 3 meters, cinnamon 3 x 3 and durian : 15 x 18)
- 2 - Rubber + cinnamon (Rubber 12 x 3 X 3 meters, cinnamon 3 x 3)
- 3 Rubber alone (normal density : 550 trees/ha 6 x 3 meters).
- 4 - Cinnamon alone (normal density : 1111 trees/ha 3 x 3 meters).

RUBBER FERTILIZATION :

TCSDP like fertilisation programme for UREA only for the first 2 years

WEEDING :

Medium weeding : 6 weedings/year

Plot size : 1 500 m^2 (44 trees)

Number of plots : 4

Total size per replication : 4 x 1500 m^2 = 6 000 m^2

Statistical design : randomized complete block design.

Questions :

Manual weeding or use of herbicide ?

ANNEX 5

MEMO / RAS METHODOLOGY

RUBBER TREES GROWTH MONITORING IN RAS EXPERIMENTS

The first 6 month are very important in term of growth as rubber trees should develop correctly up to 5/6 whorls (normally 1 per month in good conditions). Then, the canopy and the girth begin to develop.
Therefore, the growth monitoring of rubber trees may be done as following :

- A - during the first year :

3 measurements :

- 1 - Diameter 10 cm above grafting point.

- 2 - number of whorls
control the distribution of trees with 1, then 2, 3, 4 and 5 (or more) whorls every 3 months in order to see the possible delay in growth compared to a standart growth (1 whirl per month in normal conditions).

% of trees per plot with x whirls

NUMBER OF WHORLS

Time of monitoring	1	2	3	4	5 and more
P+3 months	%				
P+6 months	%				
P+9 months	%				
P+12 months	%				

P = Planting time

-3 - The height of rubber trees should also be monitored, in particular in comparison with the average height of the forest regrowth in the interrow for RAS 1. Same frequency as for the number of whorls and diameter.

These 3 measurements may be done on the data file for RAS.

- B - at 12 months and every plantation birthday :
control of the circumference of rubber trees at 1 meter above ground level with a selected number of trees per plot. For tree sampling, refer to annex (from Rubber/CIRAD-CP) with 30 trees per plot to be monitored.

ANNEX 6
MEMO / RAS METHODOLOGY

RAS 1

TITLE
Clonal rubber in agroforestry environment : genotype x environment interaction.

OBJECTIVE/HYPOTHESE
OBJECTIVES
- To investigate the growth of an improved rubber clone (PB 260) in close to jungle rubber conditions, under various intensities of weeding, with emphasis on the critical first 2 years of establishment.

- To compare growth of this clone under currently prescribed 'standard' (theoretically optimal) plantation management conditions (TCSDP technological package), with its growth under three variants of close to jungle rubber management (differing by increasing intensity of weeding on the rubber row). Secondary forest is allowed to grow in the inter-row.

Hypotheses

Main Hypothesis
- Increasing intensity of weeding within the rubber row (compared to that of unselected seedlings) will result in greater growth of rubber due to a decrease in intensity of below-ground competition from regenerating secondary forest species, taking into account the fact that clones required more weeding than unselected seedlings (Note : clones have never been tested in close to jungle rubber conditions).

Secondary Hypotheses
- 1. Increased intensity of weeding only within the row will not affect the regenerative capacity of the useful secondary forest species (e.g : fruits and timber trees, rattan....).
E.g. constant disturbance will not preclude the establishment of useful secondary forest species due to e.g. dominance of grasses (or ferns)
(Theoretically this disturbance should not be too detrimental to soil fertility, if slash is left as mulch. Soil is still protected)
- 2. Increased intensity of weeding only within the row will not affect the susceptibility to invasion by Imperata, except on the row.
- 3 Secondary forest regrowth in the inter-row may not be more competitive than a leguminous cover crop used in the inter-row in terms of rubber growth.
- 4 Classical LCC used for rubber are viny species and required more weeding than natural forest regrowth.

EXPECTED OUTPUTS

- To produce recommendations on the minimum amount of weed management required for successful growth of this rubber clone in smallholder (jungle rubber) conditions for a minimum level of other inputs (use of polybagged clonal planting material and fertilization the first 2 years).

- More in depth understanding on competition problem with Sandy's Williams work on both RAS 1 and her experimentation.

LOCATION : Jambi province, Kabupaten Muara Tebo, Kecematan Rantau Pandan, villages of Rantau Pandan (2 rep) and Muara Buat (3 rep) : total 5 replications in 4 sites in 2 villages.

YEAR :
planting of rubber : December 1995-january 1996, (february for 1 ras 1 plot in Rantau Pandan).

DURATION
5 to 6 years for immature period. The first 2 years are critical in terms of growth and survivability. Then, if possible, a minimum of 3 years of production monitoring.

MATERIALS AND METHOD
Treatments
1. Control: Prescribed 'standard' plantation management conditions (TCSDP), using leguminous cover crop, weeding (100cm on either side of the trees). Weeding : **9 times a year, the first 2 years**
2. Regrowth of secondary forest in inter-row area, 'Low' intensity of weeding in the rubber : Whole strip weeding, 100 cm on either side of trees, **4 times a year, the first 2 years.**
3. Regrowth of secondary forest in inter-row area, 'Medium' intensity of weeding in the rubber row: Whole strip weeding, 100cm on either side of trees, **6 times a year, the first 2 years**
4. Regrowth of secondary forest in inter-row area, 'High' intensity of weeding in the rubber row: Whole strip weeding, 100 cm on either side of trees, **9 times a year, the first 2 years**

EXPERIMENTAL DESIGN
Case 1 : Randomized block system : if we consider that GT1 and PB 260 are "clonal planting material". (5 rep).
.Case2 : as the 2 clones do not have the same growth behavior : I suggest a split plot design with 'clone' as a sub treatment (2 rep for GT1 and 3 rep for PB 260).

RUBBER
FERTILIZATION
TCSDP fertilization programme for UREA only for the first 2 years. No fertilization later.

RUBBER PLANTING DISTANCE
Standart : 550 trees/ha : 3 x 6 meters.
Rantau Pandan (Pak Azari and Ismael) have been planted with GT1.
Muara Buat :Pak Bustami and Sariono (2 plots) have been planted with PB 260

INTERCROPPING
Local rice the first year (Pak Azari's plot but rice failed) or no crop (all other plots).

INTER ROW DURING IMATURE PERIOD
The secondary forest (belukar) is allowed to grow at the conditions that trees and shrubs do not reach a height greater than that of rubber (selective cutting if necessary).

PLOT SIZE : 1000 m²
NUMBER OF PLOTS PER REPLICATION : 4 plots
REPLICATION/FARM SIZE : 4 000 m²
NUMBER OF REPLICATION 5 (2 with GT 1 and 3 with PB 260)
TOTAL SIZE OF THE TRIAL : 2 ha

DATA TO BE COLLECTED

Standart data for all RAS 1 :
- rubber growth measurements : diameter, height and worls the first year every 3 months. Then girth the second year every 3 months. Sample of 30 trees per plot (4 plots per rep).
- Farmer's labour for each plot.
- soil samples per replication on 0-10 and 10-20 cm.

Testing Hypotheses 1 & 2
To be done by Sandy.
Measurement
Measure cover of regenerated vegetation (just before or same time as weeding) with sample biomass of regenerated vegetation.
Species composition/growth form composition-just before each weeding, to assess change in dominant species/growth form?

DATA FILE FOR RAS 1
RUBBER GROWTH MONITORING

DESA :
PETANI :

RAS : **RAS 1** YEAR OF RUBBER PLANTING :
DATE :

TREE	BAGIAN A diameter	TCSDP height	whorl	BAGIAN B diameter	4 weedings height	whorl	BAGIAN C diameter	6 weedings height	whorl	BAGIAN D diameter	9 weedings height	whorl
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
average												
	DISTRIBUTION											
Worhl	1											
	2											
	3											
	4											
	5 AND +											

RAS METHODOLOGY

RAS 2.2 TRIAL PROTOCOL
RUBBER + associated trees + intercropping

TITLE
Clonal rubber in agroforestry environment : rubber + selected associated trees (92 trees/ha) + intercropping (rice or palawijas)

OBJECTIVE/HYPOTHESE
OBJECTIVES

- As in jungle rubber system where rubber seedlings are associated with various kind of trees and plants, RAS 2.2 aims to associate usefull trees (fruits and timber trees) with rubber, at a limited planting density, without subtantial decrease in rubber yield.
- Rubber is planted at normal planting density of 550/ha as associated trees are planted at 92 trees/ha with a maximum number of 30 for big trees (Durian and timber trees).

Hypotheses

- It is expected that rubber growth during immature period will not be affected by associated trees competition as these selected fruits and timber trees have generaly a slow growth pattern (in partticular for durian , local fruits and timber species).
- It is expected that intercropping during the first 3 or 4 years of rubber imature period will create a favourable environment for a good rubber growth due to intercrop weedings and secondary effect of fertilization..
- Intercropping will limit the extend of weeds such as Imperata.

EXPECTED OUTPUTS

To produce recommendations on components of RAS 2.2 :
- weed management required for successful growth of rubber clone in this environment (see if 6 weedings per year is sufficient to ensure rubber growth)
- rice varieties and amount of fertilization (for rice oriented RAS 2.2)
- the effect of palawijas intercropping on rubber growth (for palawijas oriented RAS 2.2).
- distribution of species for associated trees.

LOCATION : Jambi province, Kabupaten Muara Tebo, Kecematan Rantau Pandan, villages of Seppungur (6 rep) and Muara Buat (1 rep considered as an observation plot)

YEAR :
planting of rubber : December 1995-February 1996

DURATION
5 to 6 years for immature period. The first 2 years are critical in terms of growth and survivability. Then, if possible, a minimum of 3 years of production monitoring.

MATERIALS AND METHOD

Treatments

1. Control: rubber with intercropping only, no associated trees, 6 weedings/ year on the row. (100cm on either side of the trees).

2. Rubber + intercropping + associated trees : 6 weedings/ year on the row. (100cm on either side of the trees).

RAS 2.2/mix/palawijas
3 replications with combination of fruit trees : durian, rambutan, nangka, mango.
These replications have palawijas as intercrops. These palawijas are : banana + cassava + chili + vegetables.

RAS 2.2/DD/rice
3 replications with durian + duku.
These replications have rice (1 crop/year in rainy saison) as intercrops.

EXPERIMENTAL DESIGN

Randomized block system with analysis of each system (RAS 2.2/DD/rice, 3 rep and RAS 2.2/mix/palawijas, 3 rep)
The two trials may be combined : 6 rep : in that case : split-plot with main treament on associated trees and sub-treatment on type of associated trees/type of intercropping.

RUBBER

All rep are planted with GT1 except one with PB 260 (due to a problem of plant availability). Clone is not considered as a treatment.

FERTILIZATION

TCSDP fertilization programme for UREA only for the first 2 years. No fertilization later.

RUBBER PLANTING DISTANCE

Standart : 550 trees/ha : 3 x 6 meters.

RUBBER WEEDING :

6 weedings ayear , every 2 months, on a regular basis.

INTERCROPPING

RAS 2.2/rice : 3 rep

Rice experimentation have failed the year 1 (planting in december 1995). The fields are partly covered with rice.
Rice will be planted in september 1996 : local rice + recommended BPS fertilisation (100 kg urea + 130 kg SP 36 + 75 kg KCL). Urea is provided in 3 periods : planting time, + 40 days and + 80 days after planting.
Weeding : 2 weedings during growth.

RAS 2.2/palawijas : 3 rep

Due to rice failure in january 1996, palawijas will be cropped : banana + cassava + chili + vegetables.

Weeding : on demand.
No fertilization on palawijas.

ASSOCIATED TREES

Planting density : 92 trees/ha : 9 x 12 meters.

Case 1 : RAS 2.2/mix : combination of fruit trees.
Case 2 : RAS 2.2/DD : Durian + duku

No fertillization.
Weeding : same as for rubber (6 weedings/year).

FIELD SIZE

PLOT SIZE for rubber + intercropping : 1000 m²
PLOT SIZE for rubber + associated trees + intercropping : 1500/2000 m²
NUMBER OF PLOTS PER REPLICATION : 2 plots
REPLICATION/FARM SIZE : 2 500/3000 m²
NUMBER OF REPLICATION 6 (3 rep with tree combination and palawijas and 3 rep with durian/duku + rice)
TOTAL SIZE OF THE TRIAL : 2 ha

DATA TO BE COLLECTED

Standart data for all RAS 2.2 :
RUBBER
- rubber growth measurements : diameter, height and worls the first year every 3 months. Then girth the second year every 3 months. Sample of 30 trees per plot.
- Farmer's labour for each plot.
- soil samples per replication on 0-10 and 10-20 cm.

ASSOCIATED TREES
- tree growth measurements : girth every year at planting anniversary time for all trees per plot.

RICE
- date of planting
- date of harvest
- yield of 100 m² square at 14 % weter content

PALAWIJA

- distribution of crops and average planting density
- date of planting for each crop
- date of harvest for each crop
- yield of 100 m² square for banana and cassava.
- distribution between self-comsuption and sales

Labour requirements per plot.

DATA FILE FOR RAS 2.2
RUBBER GROWTH MONITORING

DESA :
PETANI :
RAS : **RAS 2** YEAR OF RUBBER PLANTING :
DATE :

TREE	BAGIAN A diameter	with associated trees height	whorl	BAGIAN B diameter	no associated trees height	whorl
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
average						
Worhl	DISTRIBUTION					
	1					
	2					
	3					
	4					
	5 AND +					

RAS METHODOLOGY

RAS 2.5 TRIAL PROTOCOL
RUBBER + CINNAMON

TITLE
Clonal rubber in agroforestry environment : RUBBER + CINNAMON

OBJECTIVE/HYPOTHESE
OBJECTIVES

Cinnamon is a current good crop opportunity for farmers in hilly areas in the piedmont of the Barisan moutains in Central Sumatra. Cinnamon is generaly cut and harvested at 7-8 years old and required a limited shading. The association of rubber and cinnamon valorize the immature period of rubber which profit from weedings of cinnamon.
(Rubber is planted at normal planting density of 550/ha as associated trees are planted at 92 trees/ha with a maximum number of 30 for big trees. Cinnamon is planted at 3 x 3 meters, 1111 trees per ha).

Hypotheses
- It is expected that rubber growth during immature period will not be affected by cinamon.
- It is expected that cinnamon intercropping and its consequent weeding during rubber imature period will profit to rubber growth.
- Cinnamon should profit froim the sahding of young rubber trees.
- The total shading will limit extension of Imperata in the plot.

EXPECTED OUTPUTS

To produce recommendations on components of RAS 2.25 :
- weed management required for successful growth of rubber clone in this environment.
- the effect of cinnamon on rubber growth.
- the comparison between association and monoculture of each rubber and cinnamon.

LOCATION : Jambi province, Kabupaten Muara Tebo, Kecematan Rantau Pandan, village of nd Muara Buat (3 rep)

YEAR :
planting of rubber : December 1995-February 1996

DURATION
5 to 6 years for immature period. The first 2 years are critical in terms of growth and survivability. Then, if possible, a minimum of 3 years of rubber production monitoring. Cinnamon will be harvested the year 7 or 8.

MATERIALS AND METHOD
Treatments
1. Control: rubber in monoculture. Weeding on the row. Interrow is occupied by secondary forest regrowth.
2. Rubber + cinnamon: 6 complete weedings/ year.
3 Cinnamon in monoculture

EXPERIMENTAL DESIGN
Randomized block system : 3 rep.

RUBBER

All rep are planted with GT1.

FERTILIZATION
TCSDP fertilization programme for UREA only for the first 2 years. No fertilization later.

RUBBER PLANTING DISTANCE
Standart : 550 trees/ha : 3 x 6 meters.

RUBBER WEEDING :
6 weedings a year , every 2 months, on a regular basis, on the row for Rubber monoculture and complete for cinnamon and rubber + cinnamon.

CINNAMON

Planting density : 1111 trees/ha :3 x 3 meters.
No fertillization.
Weeding : same as for rubber monoculture (6 complete weedings/year).

FIELD SIZE

PLOT SIZE for rubber + intercropping : 1000 m²
NUMBER OF PLOTS PER REPLICATION : 3 plots
REPLICATION/FARM SIZE : 3000 m²
NUMBER OF REPLICATION = 3
TOTAL SIZE OF THE TRIAL : 0,9 ha

DATA TO BE COLLECTED

Standart data for all RAS 2.5 :
RUBBER
- rubber growth measurements : diameter, height and worls the first year every 3 months. Then girth the second year every 3 months. Sample of 30 trees per plot.
- Farmer's labour for each plot.
- soil samples per replication on 0-10 and 10-20 cm.

CINNAMON
- tree growth measurements : girth 6 months afterplanting for a a sample of 30 trees per plot.

Labour requirements per plot.

DATA FILE FOR RAS 2.5
RUBBER GROWTH MONITORING

DESA :
PETANI :
RAS : **RAS 2.5** YEAR OF RUBBER PLANTING :
DATE :

TREE	BAGIAN A KARET SAJA			BAGIAN B KARET DI PLOT KARET + KAYU MANIS			BAGIAN B KAYU MANIS di plot kayu manis saja			BAGIAN C KAYU MANIS DI PLOT KARET + KAYU MANIS		
	diameter	height	whorl	diameter	height	whorl	diameter	height	whorl	diameter	height	whorl
1												
2												
3												
4												
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average												
	DISTRIBUTION											
Worhl	1											
	2											
	3											
	4											
	5 AND +											